

REMARKS

Claims 1 to 12, 15 to 23 and 26 to 28 were rejected under 35 U.S.C. 103(a) as being unpatentable over Gauthier, Jr. et al. (U.S. 6,563,176) in view of De et al. (U.S. 6,232,827) and Wu et al. (U.S. 6,727,131). The rejection is respectfully traversed.

As stated in the specification commencing at paragraph [0025], unique to the semiconductor device 200 illustrated in FIGURE 2A is a reduced source/drain gate sidewall junction capacitance (C_{jgsW}). It is believed that the position of the compensation implants 260 allows the area of the junction between the source/drain regions 250 and the halo implants 240 to be dramatically reduced, thereby causing the parasitic source/drain gate sidewall junction capacitance (C_{jgsW}) to be reduced. It is further believed that placing the lighter doped compensation implants 260 between the more heavily doped source/drain implants 258 and the heavily doped halo implants 240 creates a grating or buffer, thereby increasing the depletion junction there between. The increased depletion junction further causes the parasitic source/drain gate sidewall junction capacitance (C_{jgsW}) to be reduced.

Turning briefly to FIGURE 2B, illustrated is a process simulation image 270 of a semiconductor device similar to the semiconductor device 200 shown in FIGURE 2A compared to a process simulation image 280 of a semiconductor device similar to the semiconductor device 100 shown in Prior Art FIGURE 1. Take notice how the compensation implant 260 is located under a footprint of the gate sidewalls spacer 238 in the process simulation image 270 and the conventional lightly doped compensation implant 160 is located outside a footprint of the gate sidewall spacer 138 in the process simulation image 280.

As indicated above, the compensation implants 260 of the process simulation image 270 allow for a much lower parasitic source/drain gate sidewall junction capacitance ($C_{jgs\text{w}}$) than the conventional lightly doped compensation implants 160.

A review of Gauthier, Jr. et al. clearly indicates that the above described inventive features are not only not found in Gauthier, Jr. et al., but also the purpose of these features is not found therein. Claims 1 requires, among other steps, placing a gate structure having a gate sidewall spacer over the substrate, then creating a halo implant in the substrate on opposing sides of the gate structure, then introducing a compensation implant in the substrate proximate the halo implant at an angle abnormal to the substrate, and forming a source/drain region proximate said compensation implant, said angle reducing a capacitance associated with said halo implant or said source/drain region. Not only are these steps not found in Gauthier, Jr. et al., but, in fact, Gauthier, Jr. et al. clearly states at column 4, line 64ff that the process therein “essentially saturates out the halo implant 36a, thereby counter doping the halo implant 36a on the source junction. It follows that no halo is found at the source junction in accordance with the process of Gauthier, Jr. et al. The other cited references in no way overcome these deficiencies in Gauthier, Jr. et al. Furthermore, there can be no teaching or suggestion to combine the references in any event since neither Gauthier, Jr. et al. nor the other cited references teach or suggest such combination.

Claims 2 to 12, 22 and 23 depend from claim 1 and therefore define patentably over the applied references for at least the reasons presented above with reference to claim 1.

In addition, claim 4 further limits claim 1 by requiring that the compensation implant extend from beneath the footprint of said gate sidewall spacer toward and under the source/drain. No such feature is taught or suggested by Gauthier, Jr. et al., De et al. or Wu et al. in any proper combination either alone or in the combination as claimed.

Claim 5 further limits claim 1 by requiring that the compensation implant form a dopant gradient between the halo implant and the source/drain region, thereby reducing the capacitance. No such feature is taught or suggested by Gauthier, Jr. et al., De et al. or Wu et al. in any proper combination either alone or in the combination as claimed.

Claim 6 further limits claim 1 by requiring that the steps of introducing and forming include introducing and forming using a similar type dopant and the creating includes creating using an opposite type dopant. No such feature is taught or suggested by Gauthier, Jr. et al., De et al. or Wu et al. in any proper combination either alone or in the combination as claimed.

Claim 7 further limits claim 1 by requiring that the source/drain region include a lightly doped source/drain implant and a heavily doped source/drain implant. No such feature is taught or suggested by Gauthier, Jr. et al., De et al. or Wu et al. in any proper combination in the combination as claimed.

Claim 8 further limits claim 1 by requiring the step of forming gate sidewall spacers along sides of the gate structure, wherein the compensation implant is located at least about 10 nm under a footprint created by the gate sidewall spacers. No such feature is taught or suggested by Gauthier, Jr. et al., De et al. or Wu et al. in any proper combination in the combination as claimed.

Claim 9 further limits claim 8 by requiring that the compensation implant be located from about 10 nm to about 200 nm under the footprint created by the gate sidewall spacers. No such feature is taught or suggested by Gauthier, Jr. et al., De et al. or Wu et al. in any proper combination in the combination as claimed.

Claim 10 further limits claim 1 by requiring that the step of creating occur before the introducing and the introducing occur before the forming. No such feature is taught or suggested by Gauthier, Jr. et al., De et al. or Wu et al. in any proper combination either alone or in the combination as claimed.

Claim 11 further limits claim 1 by requiring that introducing a compensation implant include creating a counterdoped region in the halo implant. No such feature is taught or suggested by Gauthier, Jr. et al., De et al. or Wu et al. in any proper combination either alone or in the combination as claimed.

Claim 12 further limits claim 11 by requiring that the counterdoped region have a dopant concentration greater than about 1/3 of a dopant concentration of the halo implant. No such feature is taught or suggested by Gauthier, Jr. et al., De et al. or Wu et al. in any proper combination either alone or in the combination as claimed.

Claim 16 requires the same features as discussed above with reference to claim 1. Accordingly, the arguments presented above with reference to claim 1 are apropos and incorporated by reference.

Claim 22 further limits claim 1 by requiring that the step of introducing a compensation implant include creating a counterdoped region in the halo implant. No such feature is taught or suggested by Gauthier, Jr. et al., De et al. or Wu et al. in any proper combination either alone or in the combination as claimed since the halo region is removed in Gauthier, Jr. et al.

Claim 23 further limits claim 22 by requiring that the counterdoped region have a dopant concentration greater than about 1/3 of a dopant concentration of the halo implant. No such feature is taught or suggested by Gauthier, Jr. et al., De et al. or Wu et al. in any proper combination either alone or in the combination as claimed since the halo region is removed in Gauthier, Jr. et al.

Claims 17 to 21 and 26 depend from claim 16 and therefore define patentably over the applied references for at least the reasons presented above with reference to claim 16.

The arguments presented above with reference to claim 3, 4, 6, 7 and 8 apply to claims 17 to 21 respectively as well.

Claim 27 is similar to claim 1 except that it is in structure format. The arguments presented above with reference to claim 1 are apropos and incorporated by reference.

Claim 28 depends from claim 27 and therefore defines patentably over the applied references for at least the reasons presented above with reference to claim 27.

In view of the above remarks, favorable reconsideration and allowance are respectfully requested.

Respectfully submitted,



Jay M. Cantor
Attorney for Applicant(s)
Reg. No. 19,906

Texas Instruments Incorporated
P. O. Box 655474, MS 3999
Dallas, Texas 75265
(301) 424-0355 (Phone)
(972) 917-5293 (Phone)
(301) 279-0038 (Fax)